# MISSOURI BOTANICAL GARDEN

# Bulletin

Volume XLVI
November, 1958
Number 6


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COVER: *Cattleya* × *Mayor Tucker,* a new cluster-type Orchid hybrid with dark lavender-purple, beautifully-shaped flowers with ruffled lips. The parents are *Cattleya Bowringiana* var. *Splendens* and *Cattleya Juanna.* (See article, page 75). Photo by Lad Cutak.

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Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Published February, March, April, June, September, and November by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $2.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

# Missouri Botanical Garden Bulletin

Vol. XLVI No. 6 NOVEMBER, 1958

## HYBRIDIZING CLUSTER-TYPE CATTLEYAS

ROBERT J. GILLESPIE

THE desire for something new and different is a universal human trait that pervades all phases of man's activities. Orchid hybridists are by no means the exception to this rule. In recent years many breeders have been turning their attention to some of the small-flowered Laelia and bifoliate (two-leaved) Cattleya species as a source of genetical material for the production of new and unusual orchids. Actually the Cattleya tribe contains a large number of small-flowered species, only a few of which have been used to any degree by the modern hybridists. By crossing some of these small-flowered species of Cattleya with the large-flowered species and with the large-flowered Laelias, orchid breeders are now producing an exciting array of new hybrids, many of which will be unusual and strikingly different from the commercial hybrid Cattleya popular today. Many amateur orchid hobbyists are now becoming interested in hybridizing these small-flowered Cattleyas and many of them are producing excellent hybrids. It is the purpose of this article to further stimulate their interest by discussing some of the more common breeding problems encountered with these hybrids. Sterility, floriferousness and flower size, and flower color will be briefly discussed.

### STERILITY

Genetically the bifoliate Cattleyas seem to be quite distinct from the large-flowered labiate Cattleyas and Laelias. Complicated interspecific and intergeneric Cattleya and Laelio-Cattleya hybrids, which have varying degrees of polyploidy (having more than two sets of hereditary structures, the chromosomes), exhibit a surprisingly high degree of fertility. On the other hand, some of the simple bifoliate-labiate Cattleya hybrids are completely sterile. Investigation of these sterile hybrids almost invariably indicates that sterility is due to polyploidy. This sterility is present regardless of whether the bifoliate or the labiate parent has introduced the polyploid condition into the hybrid. For example, *Cattleya* × *Chapmanii* var. *Splendens* (triploid), is a sterile bifoliate-labiate hybrid in which an extra set of chromosomes was inherited from the bifoliate parent, *Cattleya Bowringiana* var. *Splendens*, which is a tetraploid. The reverse situation is found in *Laelio-Cattleya* × *Tangerine*, a Missouri Botanical Garden hybrid between *LC.* × *Mimi Koehler* (polyploid, exact cultivar unknown) and *Cattleya aurantiaca* (diploid); for this hybrid inherited its polyploid condition from the labiate Laelio-Cattleya parent. *LC.* × *Tangerine* is

a beautiful yellow cluster-type orchid which would made an excellent parent for future breeding work; but thus far it has been completely sterile. A hybrid half-sister to *LC.* × *Tangerine* is *C.* × *Confetti*, a primary bifoliate-labiate hybrid in which both parents (*C. Trianae* var. *Delicata* and *C. aurantiaca*) are diploids. (A hybrid is a *primary* hybrid if neither of its parents was a hybrid.) The diploid hybrid, *C.* × *Confetti*, has proved to be extremely fertile and all seedlings from it are vigorous, normal growers. Although it is not our purpose here to attempt an explanation of why sterility in these hybrids is always coupled with polyploidy, theoretically, it should be possible to produce a completely fertile bifoliate-labiate Cattleya hybrid by crossing a selected tetraploid of the bifoliate group with a selected tetraploid of the labiate group. The Garden is now in the process of making several such carefully controlled crosses and the results, combined with cytological investigations, should be enlightening.

## FLORIFEROUSNESS AND FLOWER SIZE

Frequently hybridizers have expressed disappointment with cluster-type hybrids because they fail to have a desirable flower size and/or sufficient number of flowers per stem. Most breeders attempt to predict floriferousness and flower size of their hybrids by using the arithmetic mean. Actually, the flower size and floriferousness of any proposed or existing cross can be accurately predicted by employing the geometric rather than the arithmetic mean. The Garden's *Cattleya aurantiaca* hybrids will once again adequately illustrate this point. In *Cattleya* × *Confetti*, the *C. trianae* parent has a flower spread of 12.0 cm., while the *C. aurantiaca* parent has a flower spread of 2.5 cm. By using the arithmetic mean to compute the average flower-spread to be expected in the hybrids between these two plants, we obtain 7.3 cm. ($2.5 + 12.0 = 14.5$; $14.5 \div 2 = 7.25$ cm.). However if we employ the geometric mean, we would predict that the hybrid flowers should be about 5.4 cm. in width, on the average ($2.5 \times 12.0 = 30$; $\sqrt{30} = 5.4$ cm.). When we actually measure the spread of the flowers of the hybrid plants produced we find that it varies from 5.3 to 5.5 cm., which is evidence that the geometric mean method is reliable and accurate. The accuracy of the geometric mean when used to predict floriferousness can be illustrated by the hybrid *LC.* × *Tangerine*, of which one parent, *LC.* × *Mimi Koehler*, has 3 flowers per stem, while the other parent, *C. aurantiaca* has 22 flowers per stem. Computing the geometric mean ($3 \times 22 = 66$; $\sqrt{66} = 8.1$ cm.), it is calculated that the plants of this cross will average 8 flowers per stem. Although this hybrid is only reaching maturity, those few plants which are mature have 7–8 flowers per stem. This shows how the plant breeder can, with surprising accuracy, determine flower size and floriferousness of any primary bifoliate-labiate Cattleya hybrid even before the cross is made.

## COLOR

One of the alarming practices which

some orchid breeders have been employing recently is the crossing of a white labiate-type hybrid Cattleya with a colored cluster-type Cattleya or Laelia, presumably on the assumption that the white Cattleya will act genetically as it appears physically, that is to say, as a "white" or "neutral" background against which the brilliant colors or unusual markings of the smaller-flowered parent can be expressed in a dominant way in the hybrid. To prove the fallacy of such thinking, one has only to review Hurst's classical paper on white Cattleyas, published in 1925 (*Experiments in Genetics*) and frequently reviewed by numerous authors in many subsequent publications. Hurst's work shows that the white labiate Cattleya can be thought of as a machine, built exactly like its colored counterpart, with its germplasm containing factors for color, the usual emphasis on a darker labellum, etc. The only thing which sets it apart is the fact that somehow a small piece of the genetic machine is missing. Thus the entire color machine is latent and cannot function even though ninety percent of it is in perfect running shape. When the white labiate Cattleya transmits this machinery to offspring who have received the missing genetical part from another parent (presumably any colored parent would do this), the result, of course, is that this unknown color machine can function and express itself in the progeny. Therefore it becomes quite evident that the white labiate Cattleyas cannot be thought of as "neutral" or "passive" background in hybridizing; they will produce a variety of unpredictable and frequently undesirable color types in their progeny.

SUMMARY

In hybridizing cluster-type Cattleyas, 1) sterility in primary hybrids is usually associated with polyploidy, 2) floriferousness and flower size in the hybrid follow the geometric mean of these characters between respective parents, and 3) white labiate Cattleyas cannot be used as genetically "neutral" color parents; they contribute significantly to the flower color of their progeny.

## CATTLEYA × MAYOR TUCKER

We at the Missouri Botanical Garden are particularly pleased with the cleaning up of our city air. When air pollution in St. Louis became worse and worse, it finally became impossible to grow our famous orchids in town any more; and in 1926 the whole orchid collection had to be moved to Gray Summit. For display and for the orchid shows, plants had to be moved back and forth to town. But now, with clean air restored to our city, the orchids have been moved back into town; and they do very well. Actually, we have not once observed a situation, so-called dry-sepal, which causes much damage to Cattleya flowers in the Los Angeles and San Fran-

cisco areas of California. Dry-sepal occurs generally after periods of smog; its lack in the St. Louis area, as well as the lack of damage to vegetables shows that our air here is cleaner than in any other American city of equal size. Therefore, in tribute to the man who did more than anyone else to clean up our air, and to make Cattleya culture possible again in St. Louis, the Garden's newest Cattleya hybrid (see cover), one of the newer cluster-type orchids from the cross *Cattleya Bowringiana* var. *Splendens* × *Cattleya Juanna*, is named "Mayor Tucker" (See cover illustration).

—F. W. Went

*Pittosporum Tobira*, a well-established tub plant at the Missouri Botanical Garden. Photo by Kenneth Peck.

# TREES AND SHRUBS AS TUB PLANTS

E. L. EVINGER

ALMOST all homes and many apartments, as well, have one or more places where a tub plant or perhaps a pair of them may be placed to add much to the attractiveness and charm of living. Homes with small yards or patios can use them to dress up otherwise bare and uninteresting corners. They can be used for privacy and concealment—a vine in a large container will screen off the barbecue pit or hide the trash disposal cans. Tub plants have the advantage of being movable to accommodate special occasions (or the mere whim of moving things about as you might the furniture in your living room). They are distinctive as a decorative furnishing for the home. In addition to being unusual in itself, a potted tree, shrub or vine offers the home gardener the opportunity to express his own individuality in the selection, growing and shaping of it, thus making possible for him to have a unique plant unlike that had by any other. We all strive to have something which is a product of our own creation and effort; and living plants, although having individuality and charm of their own, are admirably adaptable to our fancies.

## PLANTS SUITABLE FOR TUB PLANTS

The field from which to select a plant for tubbing is wide and exceedingly varied. Deciduous trees which make excellent specimens are Japanese Maples, Flowering Cherries, Ginkgos and Oaks. Among the conifers are numerous possibilities such as Deodar and Lebanon Cedars, Austrian and Japanese Pine, Umbrella Pine (Sciadopitys), Araucaria and Podocarpus. The evergreen broadleaved shrubs likewise offer a variety of good tub plants, for example Pittosporum, Oleaster (*Elaeagnus spp.*), Privits and the exotic and tropical Coral Tree (Erythrina). For colorful flowering effect all summer, many varieties of Lantanas can be grown as trees. Other shrubs such as Camellias and Gardenias provide spectacular flowers in their season. The Golden Bamboo (*Phyllostachys aurea*) and the varieties of true Ginger (Zingiber) lend an Oriental as well as a very modern touch. A tropical feeling can be obtained through the use of giant-leaved Philodendrons, Cycads, Strelitzias, or perhaps Bananas. Trellised vines such as Grape Ivy (*Rhoicissus rhombifolia*), Wisteria, Bougainvillea, Fatshedera or English Ivy can be styled to make a screen or massed effect.

## HOW TO SELECT A TUB PLANT

Some one of these plants is certain to be within the reach and ability of the average home gardener. Like African Violets, tub plants are fussy and require a lot of attention and care which is true of many things really worth while. In selecting a plant for tubbing, first visualize the maximum size you want or can accommodate, then select a suitable container. The tub, pot, or other planter must not be

too large (a twelve inch tub will hold a six foot tree). You will naturally need to begin with smaller pots for small plants and transfer from time to time to larger pots as the plants grow, until they reach the desired size. It is preferable to have a container that drains and is provided with a saucer or drip pan. Should you select a container which does not drain, such as a brass kettle, an old churn or some fancy jardinière, then it is best to put the plant in a clay pot liner. The most desirable tubs are made of wood, preferably California Redwood, Southern Cypress or Western Red Cedar, since these materials are rot-resistant. Tubs of other woods can be made long-lasting by treating them with a wood preservative stain or paint. As a refinement the tubs may be equipped with castors and/or handles.

## PLANTING INSTRUCTIONS

Most any rich well-drained soil is generally satisfactory for potting, however if the plant selected is something quite special it would be best to consult a gardening encyclopedia or ask your nurseryman for advice. Place a layer of broken clay pots, coarse gravel or other porous material over the entire bottom of the container to give maximum drainage. When using a container which does not drain and you feel you must plant directly without a liner use an inch or so of charcoal as the porous material to aid in keeping excess water sweet (or from becoming stagnant). Fill the tub with soil only to within an inch or two below the upper edge. This amount of space when filled with an inch of water at watering time will be equivalent to that much rain, which generally will be sufficient.

## CARE OF THE PLANTS

We all know that plants are dependent for their sustenance upon the available sunlight, water, minerals and carbon dioxide. We must provide, therefore, as nearly as possible, the conditions for growth to which the type of plant we are culturing is accustomed in nature. Sun plants must be given full sun and shade plants the proper filtered light. *Water carefully as needed,* never allowing the soil to become completely dry and, on the other hand, being careful not to overwater or to allow the soil to become soggy wet. Living as they must in a confined soil space, tub plants must be provided with the essential minerals by the application of proper fertilizers. A general rule is to use an organic fertilizer such as fish oil, bone meal or cottonseed meal for broadleaved evergreen plants. Commercial or balanced mineral element fertilizers are satisfactory for other plants. When in doubt it is best to consult a gardening encyclopedia or your nurseryman. Feeding no more than once a month is usually sufficient.

## SHAPING THE PLANT

The shape or style of the plant is quite important. This depends largely on the type of plant and your decorative requirements. Generally speaking, tub plants should not be pruned, that is, not in the ordinary fashion of snipping off branches, for you want to keep as many of the young green

leaves as possible. The best practice is to watch the plants carefully and pinch out the terminal buds as the plant reaches the desired size. The direction of growth can be altered or encouraged in this way. Do not be afraid to nip these buds—plants are long-suffering and will respond to our whims or fancies. The original selection of the particular plant subject to use for tubbing is of utmost importance in regard to shaping. Oftentimes while looking over a nurseryman's stock it is interesting to consider some of his "pot- or can-bound" stock which have been naturally dwarfed by their containers. These plants frequently have a made-to-order character already achieved or started. The custom of "can culture" by nurserymen has brought to light many species of plants which will tolerate cramped growing space. Such plants become dwarfed and thus they make excellent tub specimens. However, watch carefully when looking at nursery stock, for those kinds which seem to adjust their growing habits to the container as opposed to those which are decidedly unhappy and probably unsuited to tub culture.

## OFF-SEASON CARE

The over-wintering or off-season care of tub plants frequently presents a problem. After frost or a ripening period, deciduous types grown outside may be placed in a basement or garage with very little light, where they require a minimum of watering and

*Elaeagnus pungens* var. *Simonii*, an attractive tub plant, handsome for its silvery-brown foliage, with many decorative uses at the Missouri Botanical Garden. Photo by Kenneth Peck.

only an assurance that the temperature will not go below 26 degrees Fahrenheit. The broadleaved evergreens and the more tropical kinds of plants, if not to be kept in their regular places in the home, must be placed in a solarium, a bay window or other light place where the temperature will not drop below fifty degrees Fahrenheit at night. They will of course need watering. Nurseries frequently offer "boarding space" as a service to tub plant owners.

### TUB PLANTS NOT "BONSAI"

The growing of plants, particularly the tree types, in tubs or other suitable containers should not be confused with the true dwarf or "Bonsai" trees. This kind of culture is an art in itself and requires study, care, time and infinite patience to produce an artistic creation. However, plants kept properly in tubs will live and flourish over a long period of time. They will adjust themselves to their surroundings and frequently achieve a dwarf state not unlike a true "Bonsai".

The size of tub plants and their care, particularly in the off-season, presents a problem. Still we find it inherent in our natures to be interested enough to accept the challenge of having them about. One need only think of how our grandmothers went to all the work, worry and inconvenience of carrying her house plants and even fruit trees across the country in a covered wagon to realize this fact.

## A CENTURY OF PLANTING

It is perhaps a mark of Shaw's Garden that, after nearly one hundred years of growing orchids and other exotic things, the Garden can now claim the "world's best collection of philodendrons." The Veiled Prophet Queen carried a bouquet of 300 orchids from the Garden, while philodendrons trail over many a kitchen window or end table. But there is nothing common about any growing thing, and Shaw's Garden treats them all—in research or display—with democratic respect.

The progressive approach of the institution characterizes its plans for a centennial observance next fall. Last year, more than 217,000 persons were attracted by the Garden. This figure strongly reversed a trend of declining attendance that had set in perhaps because of television and the move to the suburbs. St. Louisans have not lost interest, certainly, any more than they have been willing to call the Garden by the official name, Missouri Botanical Garden, which merchant Henry Shaw chose for it before be willed his Tower Grove estate to the public.

But even St. Louisans do not always know how famous their Shaw's Garden is. It is ranked by botanists as the equal of London's Kew Gardens; it has an international reputation as a training center. Nearly a century old, it is no century plant that flowers once and dies; it flowers constantly for anyone who would look through its gates.

(Reprinted from the Editorial in the October 8, 1958, *St. Louis Post Dispatch.*)

## NEW HOSTAS RECEIVED BY GARDEN

THE Garden has recently received a fine group of Hostas (Plantain Lilies) from the Botanic Garden and Botanic Museum of the University of Uppsala at Uppsala, Sweden. The group, which has been added to the collection growing in the Mausoleum grounds, consists of the following species, varieties and forms:

*Hosta albomarginata, Hosta crispula, Hosta decorata, Hosta elata, Hosta fortunei* var. *albopicta, Hosta fortunei* var. *albopicta* f. *aurea, Hosta fortunei* var. *albopicta* f. *vindis, Hosta fortunei* var. *hyacinthina, Hosta fortunei* var. *obscura* f. *marginata, Hosta fortunei* var. *stenantha, Hosta fortunei* var. *rugosa, Hosta lancifolia, Hosta seiboldiana* (Typ.), *Hosta sieboldiana* var. *elegans, Hosta ventricosa, Hosta undulata, Hosta undulata* var. *univittata* (2 selections). —E.L.E.

## BOOK REVIEWS

*Enjoying America's Gardens.* By Joan Parry Dutton. 311 pp., 28 pp. ills. Reynal & Company, Inc., New York, N. Y. Price $5.00.

THIS book has a special quality, which you see at once when you take it up. At the beginning of each chapter there is a delightful pen drawing, fitting in beautifully with the text (but why was the artist, Grambs Miller, not mentioned on the title page?). As one starts to read one is soon absorbed by the author's fresh outlook and beautiful style, and by her interesting information. Mrs. Dutton writes about flowers, which she knows so well, about the great horticulturists who introduced them, about the gardens where they grow or their countries of origin, about the growers she has met, but above all, she writes about America. And she does this superbly well. She came here from England for a visit, but soon became so engrossed by America, its land, people, plants and gardens, that she stayed for years, and returned again after a trip back home. By the way, she met an American and married him. We Americans will enjoy listening to Mrs. Dutton, and will gain a new perspective of our country, whereas her book will be equally informative to the traveler from abroad.

There is only one of the 27 chapters which is all about a garden, and this is about "Magnificent Longwood". But in the last chapter Mrs. Dutton sums up her garden experiences: "To compare America and England gardenwise is not only unfair but absurd. America as a whole is not so garden-minded as England, which probably has more gardens, more home gardeners than any other country of the world. To England gardening is as painting is to France or skiing to Switzerland. About ten million out of forty-two million English are gardeners; Amer-

ica's gardening population is probably no more than five million among a total population of one hundred and sixty million. Make no mistake, however, half as many gardens as England is a lot of gardens, and America is less than half England's age." It is good to ponder this: for we Americans are still far removed from the desirable goal: a garden for everyone, whether it be the vast expanses of a country estate or a small window box in an apartment.

You want another reason to read this book? Listen to this statement: "If I were asked if there was one single feature of American gardens as a whole which had caught my attention, I would unhesitatingly say the lack of hedges." If you agree, you will want further similar information; if you disagree, find out why the author came to this conclusion.

The spelling of Latin names could be improved in many cases (e.g. on p. 154, thyrsiflorus, Artemisia and Eschscholzia are misspelled), but this is about the only criticism I have.

—F. W. Went

*Exotica.* Pictorial cyclopedia of indoor plants. Alfred Byrd Graf. Roehrs Company, Rutherford, N. J. 1958. 4000 illus., 644 pp. $17.50.

THE last two decades have seen a revolution in the way tropical and subtropical plants have been introduced into cultivation in the temperate zone. Glass-sided homes, fluorescent lighting, plastic glass, and air-controlled equipment have made it possible for millions of Americans to live with tropical plants throughout the year if they so desire. The five-day week has brought to people with lively minds the need for more absorbing hobbies. The rise of mass-production ornamental horticulture has been one of the results. The gardens and the jungles of the tropics and subtropics are being combed for likely plant material.

A little-known species or hybrid of *Peperomia* or *Syngonium* may now be in mass production within two years from the time it was first collected in the back corners of Brazil. There are already over 150 species and varieties of *Philodendron* in cultivation in this country; hybridization programs are well under way which will multiply the number of named varieties in another decade. The total national business in African violets alone, I am reliably informed, now grosses more than all the nursery business in temperate and tropical fruits, apple trees, peach trees, current bushes, avocado trees, and so on. The poorly known genus *Schefflera* was of so little commercial importance when the last edition of Bailey's *Manual of Cultivated Plants* was being planned that it did not even qualify for admission. Today the production of large tubbed specimens for glass-sided office buildings has become big business. One can scarcely stroll through the business district of a city in the eastern United States without seeing a *Schefflera* (or near-*Schefflera*, for the precise limits of the genus have not yet been worked out) in a bank or cafeteria.

This trend is the raw material of social history; it is changing various kinds of attitudes toward plants and toward their cultivation and study, in all classes of society in the United States. Eventually our technical, botanical and horticultural works will catch up with this flood of new introductions and reduce to some kind of order their identification, history, and significance. Until then, the amateur, the social historian, the horticulturist, even many taxonomic botanists will get their most immediate help out of Graf's remarkable book. Most systematists who give their concentrated attention to the sections of the book dealing with their own specialties will wince at the inaccuracies they find; many of them, however, will learn to use the book as an effective first approach to the other fellow's specialties. That anyone should have been able to survey this rapidly growing flood of exotic plants is a marvel; that a busy executive like Graf should have produced this 644-page compendium approaches the miraculous. He is the manager and a director of the Roehrs Company of Rutherford, New Jersey, one of the principal dealers in and growers of this kind of plant material.

The chief feature of the book is some 450 pages of clear photographs illustrating close to 4000 of the species and varieties of tropical and subtropical ornamental plants. There are indices to common names and scientific names, a glossary of botanical terms, short semi-technical descriptions, a section on pest control, and a discussion of the climates from which these plants came, complete with a climatic map of the world. There are short introductory pages on the care of house plants (don't overfeed and don't overwater!) which are of more practical help to the average intelligent person than most books on the subject.

One of the most valuable features of the book is a 40-page summary of the kinds of places where these plants have been collected. There are on each of these pages three or four of Graf's excellent photographs showing the deserts and jungles, the temples, gardens, and nurseries from which ornamental plants have been gathered. Graf's comments supply an effective summary of the conditions under which ornamental plants are being grown in various parts of the tropics, as well as considerable insight into why they are being grown and the various ways in which they are being used. Since he has traveled and collected throughout the tropics with an inquiring mind and a good camera, he has unwittingly produced our first compendium of tropical man's attitudes toward plants.

—Edgar Anderson

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*Washington University*

(Reprinted from *Science*, August 8, 1958.)

## SPRING FLOWER SHOW CALENDAR

| | |
|---|---|
| February | |
| 7–28 | Orchid Show |
| March | |
| 1–15 | Orchid Show continued |
| 28–29 | Easter Display |
| April | |
| 4–5 (depending on season) | Daffodil Show |
| May | |
| 2–3 | African Violet Show |
| 18–19 | Spring Flower Show |
| 23–24 | Rose Show |
| July | Cactus Show |

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## SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical Garden (the official name chosen by Mr. Shaw) carries on the garden established by Henry Shaw over a century ago at TOWER GROVE, his country home. It is a private institution and has no support from city or state. The old stone walls and cast-iron fences, the Linnaean House, the Museum, the Mausoleum, and the TOWER GROVE mansion all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's and Christmas) from nine A. M. until seven P. M. spring to fall and until six in the winter time though the greenhouses close at five. TOWER GROVE, itself, Mr. Shaw's old country home, is open from one until four, admission twenty-five cents, with special guides. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one most used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southhampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 A. M., but is closed on Saturdays, Sundays, and holidays. The step-in gate (more or less concealed by the big Cleveland Ave. gate, 2221 Tower Grove) is nearly always open, and there is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., adjacent to State Highways 50 and 66. It is open every day in the year and has auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi which are at their best in April.